AUTO-ADJUST TURBO-METER PROGRAM
(For ROC300-Series and FloBoss 407)

User Manual

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Process Management

Revision Tracking Sheet

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This manual may be revised from time to time to incorporate new or updated information. The revision level of each page is indicated at the bottom of the page opposite of the page number. A change in revision level to any page also changes the date of the manual which appears on the front cover. Listed below is the revision level of each page.

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1 INTRODUCTION

The Auto-Adjust Turbo-Meter Program (98Q029) is designed for ROC300-Series Remote Operations Controllers (ROCs) and FloBoss 407 Flow Managers to interface with Auto-Adjust Turbo-Meters. The program provides the synchronized 2 rotors pulse input readings, self-adjusting algorithms run, and raw-volume output to a selectable AGA flow in the ROC/FloBoss.

The program is configured and downloaded to the ROC/FloBoss by using either ROCLINK Configuration Software (for DOS) (Version 2.20 or greater) or ROCLINK for Windows Configuration Software (Version 1.01 or greater). The program can be installed in ROC300-Series units with a FlashPAC. The program can also be installed into FloBoss 407 memory.

The Auto-Adjust Turbo-Meter Program installed in a FloBoss 407 controller has been tested by Invensys and certified to perform the auto-adjust algorithm correctly.

The components of 98Q029 are:

- An Auto-Adjust Turbo-Meter that outputs 2 analog pulse input signals.
- Optional PI Modules.
- The Auto-Adjust Turbo-Meter user program, which loads into ROC memory to provide support for the Auto-Adjust Turbo-Meter.
- Files to customize ROCLINK (for DOS) Configuration Software for the Auto-Adjust application, if applicable.

For a ROC312, the Auto-Adjust Turbo-Meter program allows up to 3 Auto-Adjust Turbines to be attached, for a FloBoss 407, it allows up to 2 Auto-Adjust Turbines, and for a ROC364 it allows up to 5 turbines to run at a time.

If the program is intended to be used with the ROCLINK EFM utility, then a third “dummy” PI needs to be configured for each flow to buffer data between the Auto-Adjust Turbo-Meter and the AGA point. The number of Auto-Adjust Turbines that can be attached to a ROC312 or FloBoss 407 subsequently decreases.

- **NOTE: IMPORTANT** When used with Auto-Adjust Turbo-Meter Program, a built-in PI on the ROC312 can handle frequencies of up to 1 kHz maximum. A PI module and the FloBoss 407 built-in PI can handle frequencies of up to 10 kHz. Never attach a Main Rotor to the ROC312 PI if its frequency is expected to be more than 1 kHz; use a PI module instead.

This manual assumes that the user is familiar with the ROC and its configuration. For more information, refer to either the *ROCLINK (for DOS) Configuration Software User Manual* (Form A6051) or the *ROCLINK for Windows Configuration Software User Manual* (Form A6091).

2 INSTALLATION

The wiring of a ROC300-Series or FloBoss 407 unit to an Auto-Adjust Turbo-meter requires the use of 2 Dual-Channel Safety Barriers. The safety barrier should be installed in the Safe Area with the FloBoss unit, rather than in the Hazardous Area with the turbo-meter. The safety barrier may be purchased from Equimeter, an Invensys company.

Before wiring the FloBoss 407 or ROC300-Series unit to the Safety Barrier and **slot** sensor turbo-meter, refer to Figure 1 and to Invensys drawing number MM-2126-B. Before wiring the ROC/FloBoss to the Safety Barrier and **blade tip** sensor turbo-meter, refer to Figure 2 and to Invensys drawing number MM-1922-B. Follow all instructions on the Invensys drawing and on any literature that accompanied the safety barrier and turbo meter. The wiring connections to PI modules is the same for ROC300-Series units.

When installing a turbo-meter, use 2 Dual-Channel Safety Barriers and a Power Safety Barrier. The power for each of the Dual-Channel Safety Barriers should be 24 Vdc. It is not be possible to power the barriers from the ROC/FloBoss.

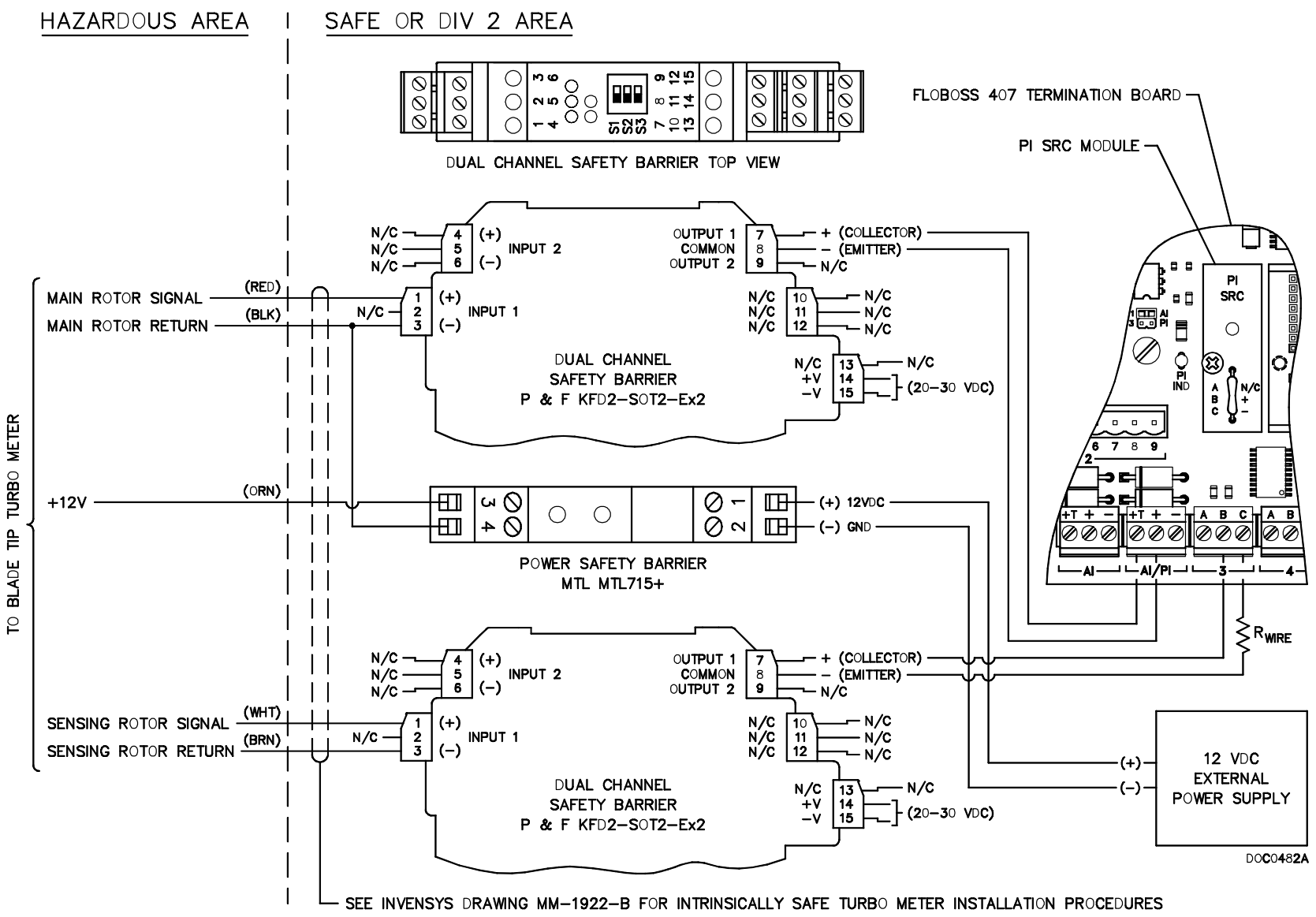

Figure 1. Turbo-Meter with Blade Tip Sensor Installation

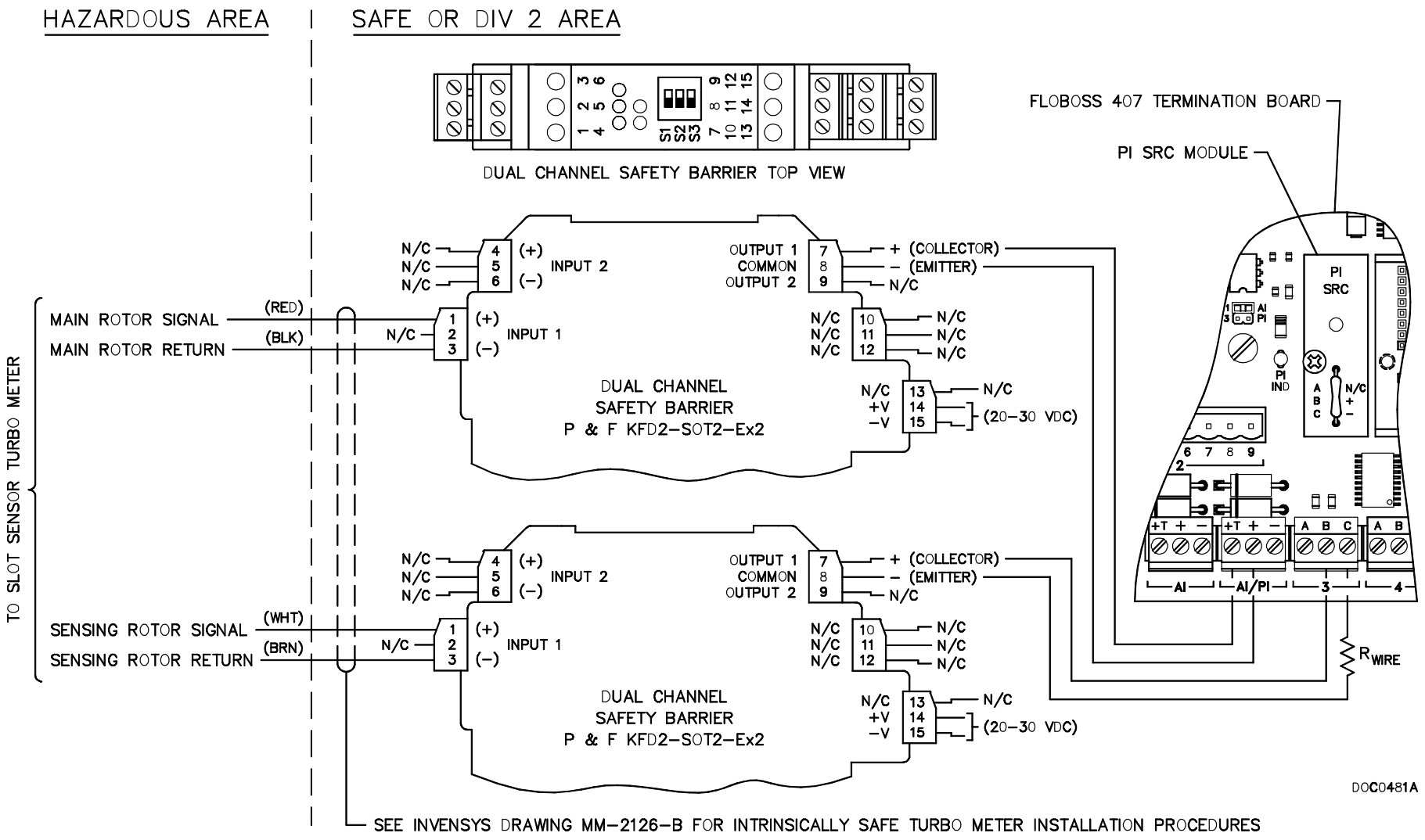

Figure 2. Turbo-Meter with Slot Sensor Installation

3 OPERATION

The ROC reads the pulse counters 10 times a second for all configured meter runs which are set to run the Auto-Adjust Turbo-Meter algorithm. Each second the ROC runs Auto-Adjust Turbo-Meter algorithms, calculates a corrected daily raw flow rate for each configured Auto-Adjust Turbo-Meter run which may feed an AGA calculation, and updates alarms and diagnostic messages.

When using the Auto-Adjust Turbo-Meter user program in a ROC, there is no specific need to use any other Equimeter equipment to interface an Auto-Adjust Turbo-Meter. For information on additional barrier equipment, see Section 2.

3.1 Auto-Adjust Calculations

The purpose of the Adjusted volume calculation is to provide a measurement registration that is adjusted back to original factory calibration accuracy, compensating for meter changes or for abnormal flow conditions.

The Auto-Adjust calculations, equations and flowcharts are detailed in “Auto-Adjust Turbo-Meter Algorithms” manual, ©1997, Equimeter Inc., an Invensys Company.

4 DOWNLOADING THE AUTO-ADJUST TURBO-METER PROGRAM

❖ **NOTE:** A PC-compatible computer must be connected to the ROC Operator Interface port before downloading is started, and RAM must be available in the intended download area.

4.1 Program Download Requirements

The driver program is downloaded to, and then run from Flash and RAM memory in the ROC/FloBoss. The following information shows the requirements for downloading and running the software (98Q029):

Program	*ROC Device*	*Task*	*Code at:*	*Data at:*	*UDPs*
EQM2D0B4.H00	ROC300-Series with FlashPAC v.2.11 or greater	USER 2	D000	B400	31
EQM3D8BC.H00	ROC300-Series with FlashPAC v.2.11 or greater	USER 3	D800	BC00	29
EQM2B064.H00	FloBoss 407 v.1.06 or greater	USER 2	B000	6400	31
EQM3C474.H00	FloBoss 407 v.1.06 or greater	USER 3	C400	7400	29
EQM3D8B8.H00	ROC300-Series with FlashPAC v.2.11 or greater	USER 3	D800	B800	23
EQM3C070.H00	FloBoss 407 v.1.06 or greater	USER 3	C000	7000	23

All versions use 32kB memory for code (2 blocks) and 16kB memory for data (1 block).

For information on viewing the memory allocation of user programs loaded in the ROC or FloBoss, refer to the *ROCLINK Configuration Software (for DOS) User Manual* or the *ROCLINK for Windows Configuration Software User Manual.*

4.2 Program Download Procedure

This section provides instructions for installing the Auto-Adjust Turbo-Meter Program into ROC/FloBoss memory. Make sure to read Section 4.1 of this manual for program and memory requirements.

To download the Auto-Adjust Program using ROCLINK software:

1. **Connect** the ROC/FloBoss to your computer through the **LOI** port.
2. Logon to **ROCLINK** software.
3. Select **Utilities** from the menu bar.
4. Select **User Programs** (ROCLINK for DOS) or **Download User Programs** (ROCLINK for Windows).
5. Press the **Download** pushbutton (ROCLINK for DOS). A dialog box appears as shown in Figure 4.

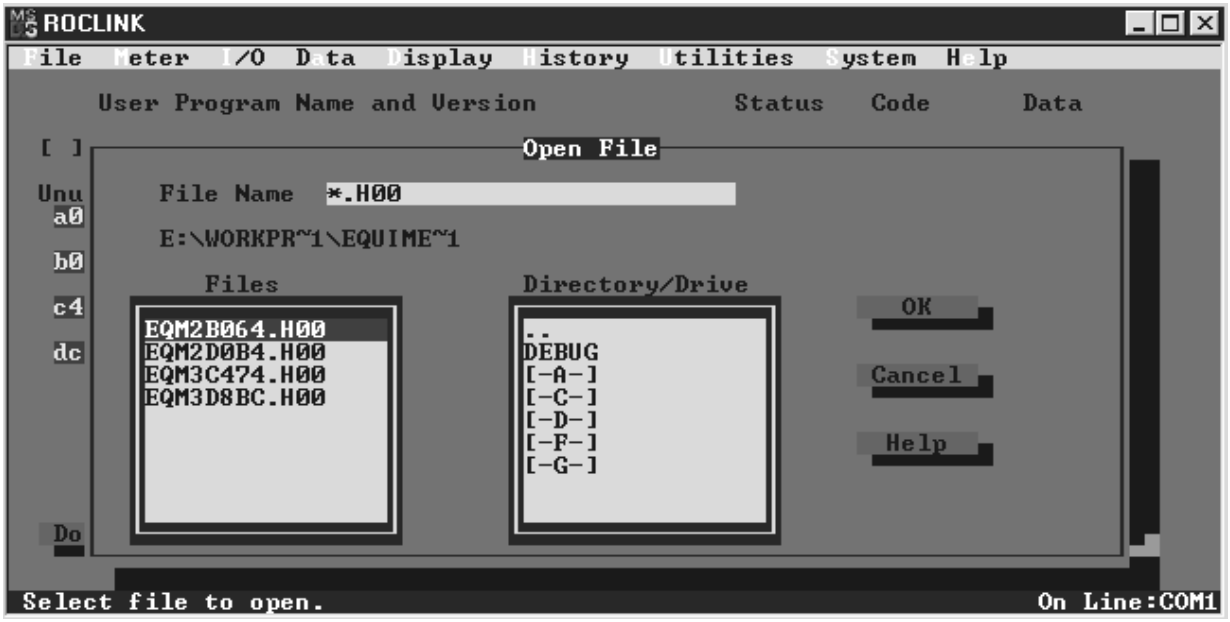

Figure 3. Open File Dialog Box (ROCLINK for DOS)

The **Open File** (ROCLINK for DOS) display lists the names of all the files that have the .H00 extension and are located in the default Drive and Directory. Use the mouse or the Up Arrow (↑) and Down Arrow (↓) to select the desired file in the Files list. You may change the path or location using the Directory/Drive field.

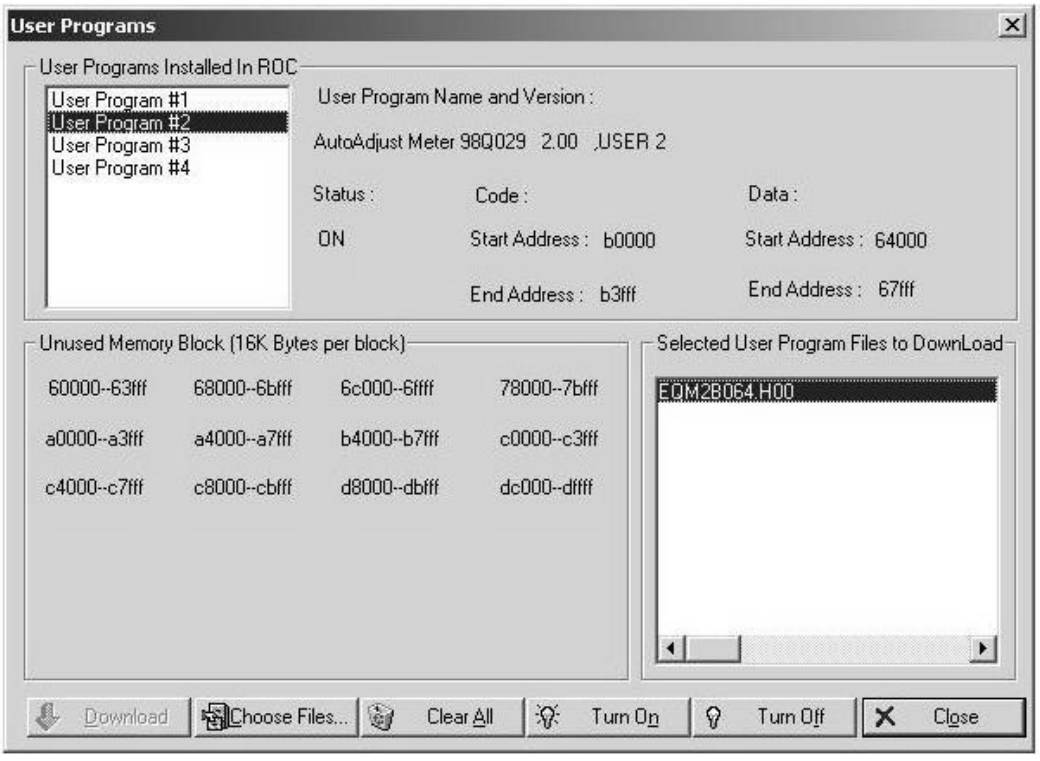

Figure 4. Open File Dialog Box (ROCLINK for Windows)

The **Choose Files** (ROCLINK for Windows) pushbutton opens a file selection window. If needed browse to locate the Drive and Directory with the Auto-Adjust (AutoAdj.H00) program files. Select the desired file in the Files list.

6. When the desired Auto-Adjust Program appears in the **File Name** field, press **Open** or **OK**.

7. You may press the **More Files** or **Choose Files** pushbutton (see Figure 5) to select additional User Programs for installation. Press the **Download** pushbutton again to begin loading the Auto-Adjust Program.

   When the program has been downloaded, the following occurs:

   - The program is automatically turned ON.
   - A Warm Start is automatically initiated.
   - A record is created in the Event Log.
   - When Section 3.3 is completed, the AutoAdj Turb option appears in the I/O menu (ROCLINK for DOS) or Configure > User Data menu (ROCLINK for Windows), allowing configuration of the needed data fields (as described in Section 4.2).

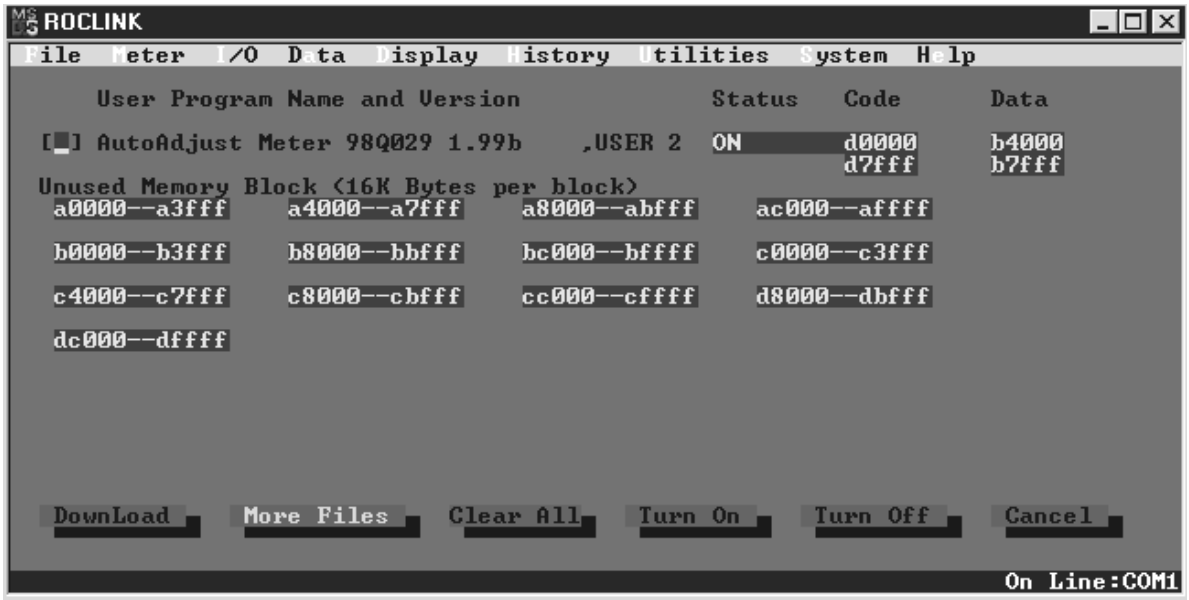

Figure 5. ROCLINK User Program Installation (ROCLINK for DOS)

8. To restart the program in the event that the program becomes inactive such as after a cold start, select **Flags** from the System menu to display the ROC Flags screen similar to the screen shown in Figure 6.

Figure 6. ROC Flags for a FloBoss 300-Series with a FlashPAC (ROCLINK for DOS)

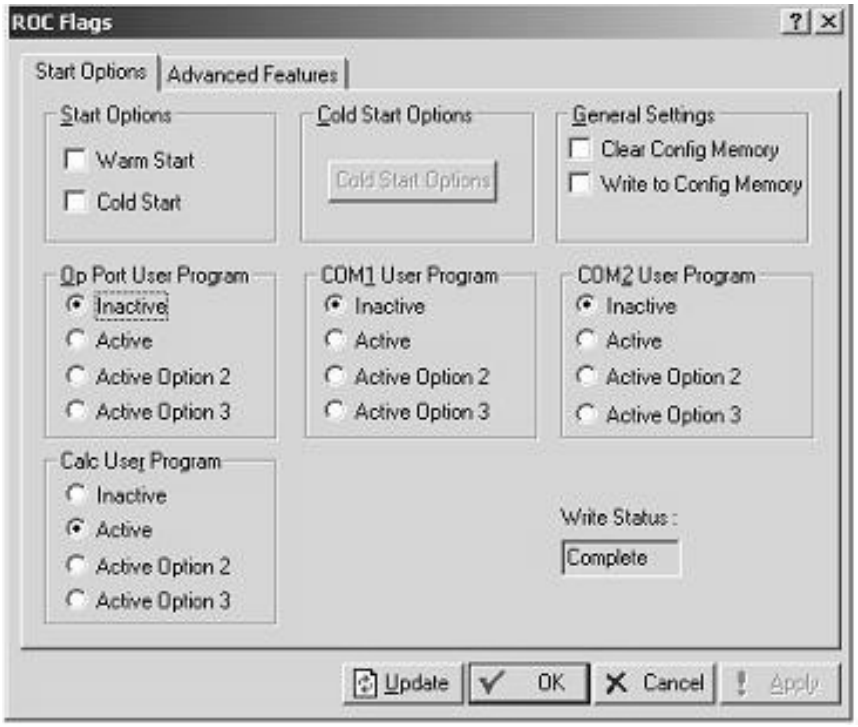

Figure 7. ROC Flags for a FloBoss 300-Series with a FlashPAC (ROCLINK for Windows)

9. Set the respective **User Program** flag to **Active** (Calc User Program is for all USER task programs).

10. Set the **Write to EEPROM** or **Write to Internal Config Memory** (ROCLINK for DOS) or **Write to Config Memory** (ROCLINK for Windows) flag to **Yes**. This ensures that when a Cold Start is performed, the User Program automatically starts.

11. Press **Apply** or **Save**.

Refer to the *RL101 ROCLINK Configuration Software User Manual (Form A6051)* or the *ROCLINK for Windows Configuration Software User Manual* (Form A6091) for additional information concerning User Programs.

4.3 Customizing ROCLINK for DOS

No custom files are required when using ROCLINK for Windows.

In order to customize the ROCLINK (for DOS) PC interface for the Auto-Adjust Turbo-Meter Program, the following files (provided with 98Q029) need to be present in the ROCLINK directory:

- Equim23.TPL - Customized interface for user point 23
- Equim29.TPL - Customized interface for user point 29
- Equim31.TPL - Customized interface for user point 31
- MENU4.TXT - Customized menu for Floboss 407. Overwrites existing file.
- MENU3.TXT - Customized menu for ROC 300 FlashPac. Overwrites existing file.
- AGASETUP.TPL - Customized AGA template, which allows AGA pulse input to see the Auto-Adjust Turbo-Meters. Overwrites existing file.

❖ **NOTE:** Without customizing ROCLINK for Auto-Adjust Turbo-Meter Program, ROCLINK will generate a flat standard graphic interface under User data menu, without windows and push buttons.

5 AUTO-ADJUST TURBO-METER PROGRAM CONFIGURATION

After the user program is loaded (see Section 4), the driver program can be configured using the ROCLINK software. A default configuration is loaded into the ROC the first time the Auto-Adjust Turbo-Meter program is installed and started. User Defined Points (UDP) are used to make this data available to the Configuration Software.

❖ **NOTE:** The PC-compatible computer that is running the Configuration Software must be connected to the ROC via the local operator port before the configuration process is started.

5.1 Configuration Access for ROCLINK for DOS

Using the ROCLINK Configuration Software, connect to the ROC and select "AutoAdj Turb" from the I/O menu.

Selection of one of the above items prompts the ROCLINK Configuration Software to read the associated UDP template from the ROC, which provides the configuration displays shown in Section 5.3 and 5.4.

5.2 Configuration Access for ROCLINK for Windows

Using the Roclink for Windows Configuration Software, connect to the ROC and select Configure > User Data > Auto-AdjTurboMeter.

Selection of one of the above items prompts the Roclink for Windows Configuration Software to read the associated UDP template from the ROC, which provides the configuration displays shown in Section 4.3.

5.3 Auto-Adjust Turbo-Meter Operation

Configuration for Auto-Adjust Turbo-Meter is handled by a user-defined point, which sets up a custom I/O "point" named Auto-AdjTurbometer. The main configuration screen is displayed in Figure 8 and Figure 9, followed by a description of each parameter.

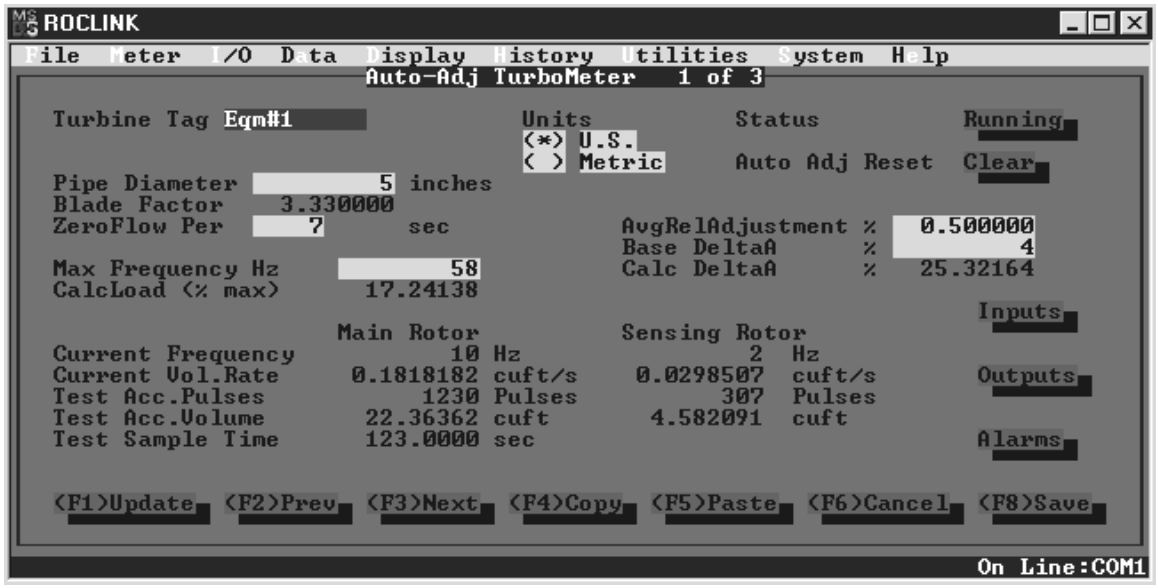

Figure 8. Auto-Adjust Turbo-Meter Main Screen (98Q029 shown) (ROCLINK for DOS shown)

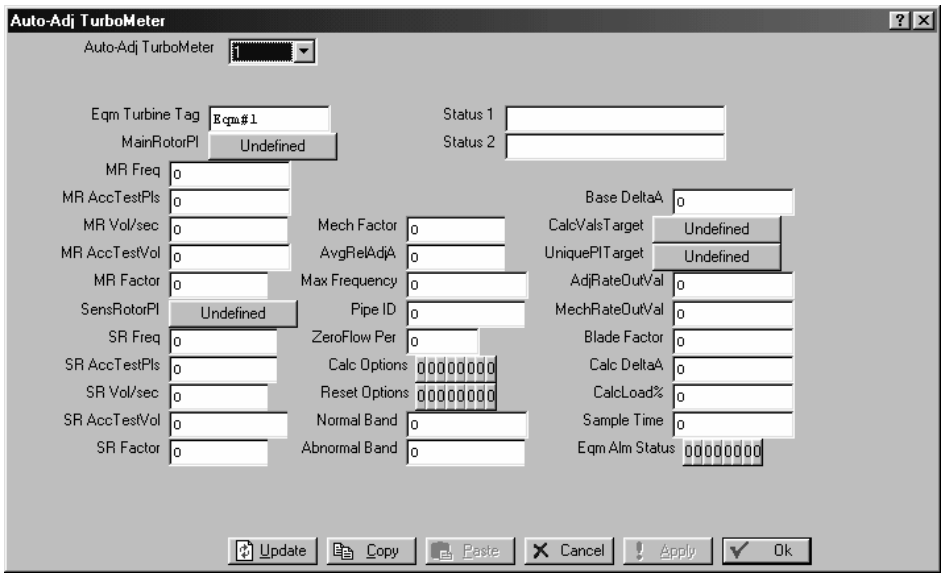

Figure 9. Auto-Adjust Turbo-Meter Main Screen (98Q029 shown)(ROCLINK for Windows shown)

Turbine Tag (ROCLINK for DOS) / **Eqm Turbine Tag** (ROCLINK for Windows) – Tag name identifying run. String, 10 characters long.

Pipe Diameter (ROCLINK for DOS) / **Pipe ID** (ROCLINK for Windows) – Pipe Internal diameter, inches if US units, mm if metric, approximate. Used only to lock-up the Blade factor. Float.

Blade Factor - Blade Tip Sensor Factor (BTSF) in Auto-Adjust calculations. The program locks up the right value according to the Pipe Diameter. For instance, any diameter value between 7 and 10 inches will be considered 8 inches (Because Auto-Adjust meter choices are only 4, 6, 8 and 12 inches). No units. Float.

ZeroFlow Per (ROCLINK for DOS) / **Zero Flow Period** (ROCLINK for Windows) – Zero Flow Period. The ROC Scan Period is hard coded to 1 second, according to the Auto-Adjust Algorithm. ZeroFlow Period timer is fired if during any second the main rotor frequency is less than a minimum. After monitoring the flow for the whole Zero Flow time, the algorithm displays the appropriate diagnostics. If the flow comes back during the Zero Flow Period, the timer is killed and normal operation resumes. Auto-Adjust algorithm has this period hard coded to 60 seconds, but the program lets the user to configure it. A typical natural gas well application will use a 10-20 seconds interval maximum to confirm that something is wrong with the meter, and to take action. Unsigned integer.

Max Frequency – Maximum Frequency, in Hz. The user enters this value from the Auto-Adjust Meter Calibration Sheet. Used to calculate the meter load, as Current Frequency/Maximum Frequency. Float.

CalcLoad (ROCLINK for DOS) / **Calculated Load** (ROCLINK for Windows) - instantaneous turbine load, in %, refreshed every second, calculated as current main rotor frequency divided by Maximum frequency. Float.

(Main Rotor) Current Frequency (ROCLINK for DOS) / **MR Freq** (ROCLINK for Windows) – displays the calculated main rotor frequency, Hz. Updates once a second. Long integer.

(Main Rotor) Test Acc. Pulses (ROCLINK for DOS) / **MR AcctTestPls** (ROCLINK for Windows) – Displays the accumulated main rotor pulses during the current Self Adjust Calculation cycle. An self adjust Calculation cycle takes either 25,000 rotations of the main rotor, or 512 seconds, whichever occurs first. Long Integer.

(Main Rotor) Current Vol. Rate (ROCLINK for DOS) / **MR Vol/Sec** (ROCLINK for Windows) – Main Rotor raw volumetric rate. Calculated as Pulse/MR Factor once a second. See also “Vm” definition in Auto-Adjust documentation. Float.

(Main Rotor) Test Acc. Volume (ROCLINK for DOS) / **MR AccTestVol** (ROCLINK for Windows) - Displays the accumulated main rotor raw volume during the current Self Adjust Calculation cycle. Float.

(Sensing Rotor) Current Frequency (ROCLINK for DOS) / **SR Frequency** (ROCLINK for Windows) – Displays the calculated sensing rotor frequency, Hz. Updates once a second. Long integer.

(Sensing Rotor) Test Acc. Pulses (ROCLINK for DOS) / **SR AccTestPls** (ROCLINK for Windows) – Displays the accumulated sensing rotor pulses during the current Self Adjust Calculation cycle. An self adjust Calculation cycle takes either 25,000 rotations of the main rotor, or 512 seconds, whichever occurs first. Long Integer.

(Sensing Rotor) Current Vol. Rate (ROCLINK for DOS) / **SR Vol/Sec** (ROCLINK for Windows) – Sensing Rotor raw volumetric rate. Calculated as Pulse/SR Factor once a second. See also “Vs” definition in Auto-Adjust documentation. Float.

(Sensing Rotor) Test Acc. Volume (ROCLINK for DOS) / **SR AccTestVol** (ROCLINK for Windows) - Displays the accumulated sensing rotor raw volume during the current Self Adjust Calculation cycle. Float.

Test Sample Time (ROCLINK for DOS) / **Sample Time** (ROCLINK for Windows) – How many seconds elapsed since last Auto-Adjust calculation was started. Resets either at 512 seconds, or when the main rotor reaches 25k pulses. Increments each second. When this value differs from exact numbers (such as 56.0000, 57.0000, and so on) for longer period of times, it indicates an unusual load of the ROC, or misconfiguration. The Auto-Adjust Calculations will still be correct.

AvgRelAdjustment (ROCLINK for DOS) / **AveRelAdjA** (ROCLINK for Windows) – Average Relative Adjustment, in %. The user enters this value from the Auto-Adjust Meter Factor badge. Float.

Calc Options (ROCLINK for Windows only) – Bit # 76543210.

Bit 0 – Units, Set to 0 = US Units, Set to 1 = Metric Units.
Bit 1 - 7 Not Used

Units (ROCLINK for DOS only) - Calc Options Bit 0 – Set to 0 = US Units, Set to 1 = Metric Units.

Status (ROCLINK for DOS)- Reset Options – Bit 0 – Set to 0 = The Auto-Adjust Turbo-Meter defined in this logical is inactive (not running)
Set to 1 = Starts/resumes the Calculations for this Auto-Adjust meter (logical).

Reset Options (ROCLINK for Windows only) – Bit # 76543210.

Bit 0, Status - 0 = The Auto-Adjust Turbo-Meter defined in this logical is inactive (not running) Set to 1 = Starts/resumes.
Bit 1, AutoAdjust Reset - Set to 0 = Auto-Adjust algorithm is running, Set to 1 = Forces a reset of the Auto-Adjust algorithm (like a warm start). Once the reset is completed, the program toggles the bit back to 0. One can also reset a meter by turning the meter "off" and "on" again (using bit 0 of reset options).
Bit 2 - 7 Not Used.

Auto Adj Reset (ROCLINK for DOS only)- Reset Options Bit 1 – Set to 0 = Auto-Adjust algorithm is running, Set to 1 = Forces a reset of the Auto-Adjust algorithm (like a warm start). Once the reset is completed, the program toggles the bit back to 0. One can also reset a meter by turning the meter "off" and "on" again (using bit 0 of reset options).
Bits 2 to 7 of Reset Options are not used. Binary field.

- **NOTE:** The Auto-Adjust algorithm is automatically restarted when the user changes one of the Main Rotor or Sensing Rotor TLP settings. This ensures correct restart including after temporarily switching a pulse input to manual.

Base Delta A - Either from the factory calibration curve, or from initial field testing, a baseline DeltaA can be defined. Units %. The Warning and Alarm limits considered at run time are centered around this value. For instance, the low warning limit would be Base DeltaA – Normal Band, and the high alarm limit would be Base DeltaA + Abnormal Band. Float field.

Calc Delta A - Calculated DeltaA, in %,results from the Self Testing Auto-Adjust Algorithm, refreshed at least every 25,000 main rotor spins or 512 seconds. Calculated Delta A(djustment) provides the measure of the amount of change that has occurred in the meter or flow condition compared to original calibration. Float.

Inputs (ROCLINK for DOS only)- The inputs push button in the main screen opens the Inputs window which is displayed in Figure 10, followed by a description of each parameter.

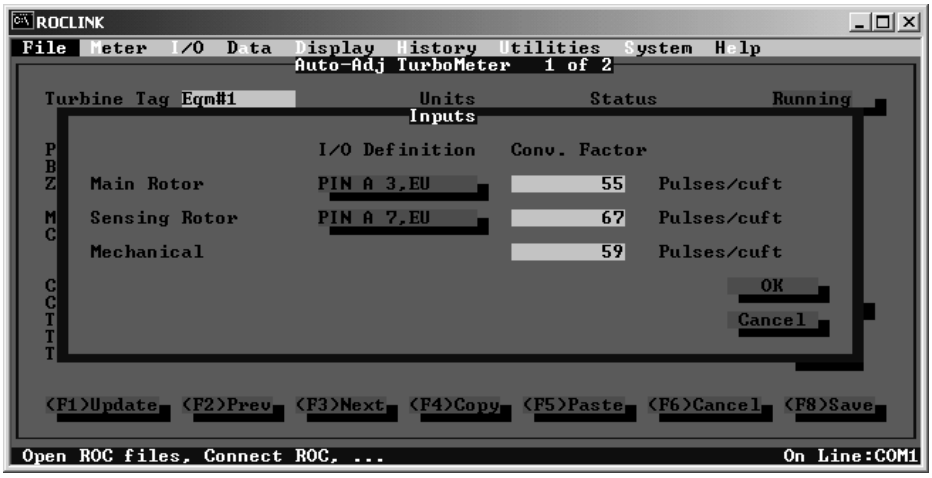

Figure 10. Auto-Adjust Turbo-Meter Inputs Window (98Q029 shown)(ROCLINK for DOS only)

❖ **NOTE:** For rotor conversion factors: US Units are in Cubic Feet. Metric Units are in Cubic Meters.

(Main Rotor) I/O Definition (ROCLINK for DOS) / **MainRotorPI** (ROCLINK for Windows) – Main Rotor TLP. The user selects the particular Pulse Input assigned for the main rotor of the turbine. The parameter selected (EU Value, Today Total, and so on) is ignored for a pulse input. When a Soft Point or FST register is selected, the program assumes that it contains accumulated pulses. TLP data type.

(Main Rotor) Conv. Factor (ROCLINK for DOS) / **MR Factor** (ROCLINK for Windows) – Main Rotor K factor (Pulses/cuft or Pulses/m3). The user enters this value from the Auto-Adjust Meter Factor badge. Float.

(Sensing Rotor) I/O Definition (ROCLINK for DOS) / **SensRotorPI** (ROCLINK for Windows) – Sensing Rotor TLP. The user selects the particular Pulse Input assigned for the sensing rotor of the turbine. The parameter selected (EU Value, Today Total, and so on) is ignored for a pulse input. When a Soft Point or FST register is selected, the program assumes that it contains accumulated pulses. TLP data type.

(Sensing Rotor) Conv. Factor (ROCLINK for DOS) / **SR Factor** (ROCLINK for Windows) – Sensing Rotor K factor (Pulses/cuft or Pulses/m3). The user enters this value from the Auto-Adjust Meter Factor badge. Float.

(Mechanical) Conv. Factor (ROCLINK for DOS) / **Mech Factor** (ROCLINK for Windows) – Mechanical K Factor (Pulses/cuft or Pulses/m3), from the Auto-Adjust calibration sheet. Is used to calculate an Uncorrected Volume, which will match with the Turbo-Meter mechanical totalizer volume. Float.

Outputs (ROCLINK for DOS only) - The outputs push button in the main screen opens the Outputs window which is displayed in Figure 11, followed by a description of each parameter.

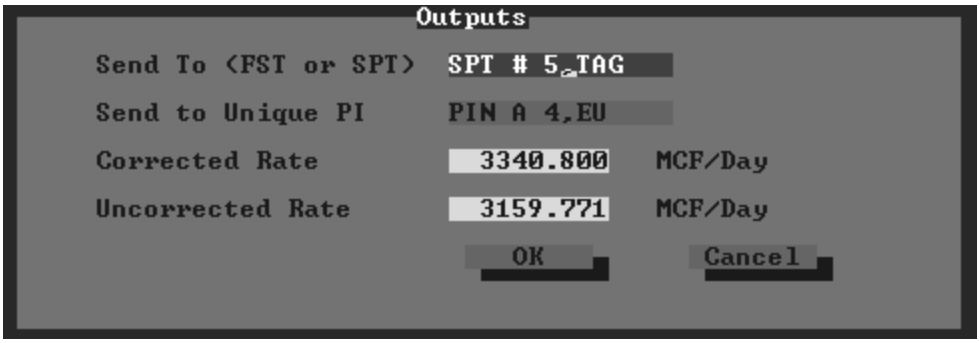

Figure 11. Auto-Adjust Turbo-Meter Outputs Window (98Q029 shown)(ROCLINK for DOS only)

Send To (FST or SPT) (ROCLINK for DOS) / **CalcValsTarget** (ROCLINK for Windows) - target for calculation values inside the ROC. Only soft points or FSTs are valid choices.

If an FST is selected, Auto-Adjust Turbo-Meter calculated values are transferred as follows:

Corrected rate -> to Register#1
Uncorrected rate -> to Register#2,
Calculated DeltaA -> to Register#3,
Calculated Load -> to Register#4,
Alarm Status -> to Miscellaneous#1,
Eqm Diagnostics -> to Message#1,
ROC Events -> to Message#2

If a Soft Point is selected, Auto-Adjust Turbo-Meter calculated values are transferred as follows:

Corrected rate -> to Data#1
Uncorrected rate -> to Data#2,
Calculated DeltaA -> to Data#3,
Calculated Load -> to Data#4,
Alarm Status -> to Integer Flag
(Eqm Diagnostics and ROC Events are not transferred)

Send To Unique PI (ROCLINK for DOS) / **UniquePITarget** (ROCLINK for Windows) - target for "Dummy" PI buffer between Auto-Adjust Turbo-Meter and firmware AGA. Using the dummy PI is the only way to synchronize EFM (AGA) reports with the Auto-Adjust. The only dummy PI valid parameter choice for this field is EU (Value in EUs)

Corrected Rate (ROCLINK for DOS) / **AdjRateOutVal** (ROCLINK for Windows) - Adjusted flow rate value, MCF/day or KM3/day. Updated each second. Float.

Uncorrected Rate (ROCLINK for DOS) / **MechRateOutVal** (ROCLINK for Windows) - Mechanical flow rate, MCF/day or KM3/day. Updated each second. Float.

- **NOTE:** Firmware AGA7 expects a flow rate (in MCF/day or KM3/day) when reading a soft point or FST register. The input is read by AGA every second and averaged at AGA's scan period.

Output Option (ROCLINK for DOS only) – Calc Options Bit 1 – Set to 0 = Transfer Corrected (Adjusted) Flow Rate to **(Corrected Rate) I/O Definition**; Set to 1 = Transfer Uncorrected (Mechanical) Flow Rate to **(Corrected Rate) I/O Definition.**

Alarms (ROCLINK for DOS only) - The Alarms push button in the main screen opens the Alarms window, followed by a description of each parameter.

Normal Band - Defines the normal tolerance for DeltaA, %. The value is treated as +/- from the base DeltaA Value. Float.

NOTE: DeltaA is defined as Percent Deviation from Relative Adjustment.

Abnormal Band – Defines the abnormal limits of the tolerance for DeltaA, %. The value is treated as +/- from the base DeltaA Value. Float.

Active Alarms – Visualizes **Eqm Alm Status** bit map, listing the Auto-Adjust algorithm exceptions. Works together with the 2 String Status Messages.

When set to a 1, each bit indicates:

bit 0 = NSF (non-steady flow)
bit 1 = SYS1 (normal no flow or loss both turbines)
bit 2 = SYS2 (leakage or resonant NoNet Flow)
bit 3 = SYS3 (Loss main rotor, leakage flow, resonant no-net)
bit 4 = SYS4 (Loss Sensing Rotor Pulses)
bit 5 = not used
bit 6 = first full Self Adjust cycle after a reset or start up.
bit 7 = one input at least in manual mode

Eqm Diagnostics (ROCLINK for DOS) – Auto-Adjust Self Check output message, 20 characters long string, possible values:

High Warning – High (Warning level) DeltaA exceeded
Low Warning – Calc DeltaA below low limit (Warning)
HiHi Alarm – HiHi (Alarm level) DeltaA exceeded
LoLo Alarm – Calc DeltaA below loLo limit (Alarm)
NonSteady Flow Warn – Non Steady Flow Detected (Warning)
NonSteady Flow Alarm – Non Steady Flow Detected (Alarm)
NoFlow/Loss Both Pls – No Flow or Loss of both pulsers
Leakage/Res NoNetFlw – Leakage or Resonant Flow(No Net Flow)
NoMR Pls/Leakage/Res – No Main Rotor Pulses, or Leakage, or resonant flow
No Sensing Pulses – No Sensing Rotor Pulses

Self Check OK – Normal Operation
Initial 25k run – First self check after reset/start-up

ROC Events (ROCLINK for DOS)– Some ROC diagnostics, 20 character-long string, possible values:

Manual - one input at least in manual mode
ROC OK – ROC ok
Messages are updated each second.

- **NOTE:** Warning/Alarm bits and messages are local and refer to DeltaA calculations. In order to use the ROC RBX capabilities, the user should consider configuring the actual pulse input associated with each rotor of a specific Auto-Adjust Turbine.

6 AUTO-ADJUST TURBO-METER SYNCHRONIZATION WITH AGA AND EFM REPORTS

In order for EFM utility to calculate meaningful reports, the input for an AGA7 calculation has to be an actual PI, rather than an soft point, FST register, or Auto-Adjust Turbo-Meter parameter.

A "dummy" PI has to be allocated for this purpose, it can be either an on-board PI or a PI module.

The "dummy's" PI EUs (Value in EUs) needs to be referenced once in the Auto-Adjust Turbo-Meter Outputs window as the "Send To Unique PI", and in the AGA inputs window as "Uncorrected Volume". In the "dummy's" settings (Under the I/O Menu), the scan period has to be set to 1 second.

Flow History (Under the Meter menu)must be set the following way:

Flowing Minutes – Archive Type = Flow Min Accum
Static Pressure – Archive Type = Flow Dep – Linear Average
Flowing Temperature – Archive Type = Flow Dep – Linear Average
Cprime – Archive Type = Flow Dep – Linear Average
Instant Flow – Archive Type = Flow Accumulation
Instant Energy – Archive Type = Flow Accumulation

Standard History (under the History menu) must be set the following way:

"Dummy" PI Accum – Archive Type = Totalize
"Dummy" PI Today Total – Archive Type = Totalize

A sample EFM report will read:

Date,hr	Flow Time	Raw Pulses	Avg (Pf) PSI	Avg (Tf) Deg F	Corrc'n Factor	Uncorr. Vol. MCF	Corr. Vol. MCF	Energy MMBTU
8/30,01	60.0	36000	147.30	60.00	10.21	15.75	159.213	164.330

Where, during the first hour on Aug, 30th:

Flow Time	= 60 minutes
Raw Main Rotor Pulses	= 36,000
Average Static	= 147.3 PSIA
Average Temperature	= 60.0 ˚F
Average Corr. Factor	= 10.21
Uncorrected Vol. Accum	= 15.75 MCF
Corrected Vol. Accum	= 159.213 MCF (15.75 x 10.21)
Energy Accum	= 164.330 MMBTU

If you have comments or questions regarding this manual, please direct them to your local sales representative or contact:

Emerson Process Management
Flow Computer Division
Marshalltown, IA 50158 U.S.A.
Houston, TX 77065 U.S.A.
Pickering, North Yorkshire UK Y018 7JA
Website: www.EmersonProcess.com/flow